PATENT CLAIMS

1. A method for reproducing data streams or data packets transmitted via at least one network (4) using at least two reproduction units (1, 2) which are at least indirectly linked to the network (4),
characterized in that
the reproduction using the at least two reproduction units (1, 2) is synchronized
either by virtue of one of the reproduction units, as master (1), prescribing its internal clock as reference and the other reproduction units (2), as slaves, aligning their internal clock with that of the master (1) via the network (4) or carrying a copy of the master clock and reproducing data streams or data packets on the basis of this aligned clock,
or by virtue of the internal clock of an external unit which is likewise available on the network being used as master and all reproduction units, as slaves (2), aligning their internal clock with that of the master via the network (4) and reproducing data streams or data packets on the basis of this aligned clock.

2. The method as claimed in claim 1, characterized in that the network (4) is a network (4) in which data packets are transmitted asynchronously or synchronously.

3. The method as claimed in one of the preceding claims, characterized in that the clock on the slave (2) is aligned before reproduction for the first time and, in particular, is updated preferably periodically during the reproduction.

4. The method as claimed in claim 3, characterized in that the periodic update is used on the slave (2) for systematically matching the speed of operation of the internal clock in the slave (2) to that of the master (1) in order to compensate for differences in the

internal propagation-time characteristics of master (1) and slave (2).

5. The method as claimed in claim 4, characterized in that the systematic matching involves scaling the internal clock in the slave (2) using a constant correction factor.

6. The method as claimed in one of the preceding claims, characterized in that the internal clock is aligned by virtue of the internal clock in the master (1) being requested by the slave (2), particularly preferably a plurality of times, and by virtue of at least one, preferably a plurality of data packets, which may be identical to the packets for requesting the time on the master (1), being transmitted from the slave (2) to the master (1) and being sent back, and the internal clock in the slave (2) being brought into line with the clock in the master (1) on the basis of a propagation time, particularly an average propagation time, for data packets between master (1) and slave (2).

7. The method as claimed in claim 6, characterized in that the propagation time is calculated as a mean taking into account the handling times in the units (2).

8. The method as claimed in one of the preceding claims, characterized in that the first reproduction unit (1, 2) which has the task of reproduction is automatically defined as master (1).

9. The method as claimed in one of the preceding claims, characterized in that the data streams or data packets are digital audio or video data or a combination thereof, particularly compressed or uncompressed audio files such as MP3, WAV, MPEG, Windows Media etc.

10. The method as claimed in claim 9, characterized in that either the same data are reproduced on the reproduction units (1, 2) or different channels of the data, particularly in the case of audio files in stereo format or multichannel (e.g. Dolby 5.1, DTS etc.), are reproduced on different reproduction units (1, 2).

11. The method as claimed in one of the preceding claims, characterized in that at least some of the data streams or data packets are temporarily buffered (5) in the reproduction units (1, 2) before reproduction, with audio files typically involving buffering in the region of approximately 1 to 5 sec, and with, particularly preferably, the buffering being performed dynamically and so as to be matched to the circumstances of the network.

12. The method as claimed in one of the preceding claims, characterized in that the individual reproduction units (1, 2) are synchronized in the region below 100 ms, preferably below 10 ms or below 2 ms, and particularly preferably below 1 ms.

13. The method as claimed in one of the preceding claims, characterized in that the network (4) is a wireless network, particularly a radio network.

14. The method as claimed in one of the preceding claims, characterized in that during the reproduction by at least one reproduction unit (1, 2) at least one further reproduction unit is switched in synchronously by virtue of the unit (2) which has been switched in automatically aligning itself with the present master (1) and starting reproduction itself after buffering some of the data.

15. The method as claimed in one of the preceding claims, characterized in that the data packets or data

streams are either fetched from a separate data server (3), or are fetched on one of the reproduction units (1), or are already available on the reproduction units (1, 2), or are made available to the system in digital form via an analog/digital converter and/or possible compression/coding unit after supply in analog or digital form.

16. The method as claimed in one of the preceding claims, characterized in that the data packets or data streams are read from a data source into a ring buffer (5) in the master (1), with each byte read in being provided with a unique address, and in that, in a process which is independent of the data stream's being read into the ring buffer (5), the master (1) sends the data to the network from the ring buffer (5) in blocks, particularly straight after reading in, by broadcast, particularly by UDP broadcast, and also particularly by multicast, with the addition of a protocol header which contains, inter alia, the address of the first byte sent, the precise master time and the address of the next byte which is to be sent by the master (1) to the codec of the master (1).

17. The method as claimed in claim 16, characterized in that the address of the next byte which is to be sent by the master to the codec of the master (1) is sent at least partly in independent control blocks, which may be identical to the control blocks for checking the clock on the master.

18. The method as claimed in one of the preceding claims, characterized in that, to protect the data integrity when a slave (2) establishes that a data portion has been lost on the network (4), this data portion is sent again by the master (1) upon a request from the slave (2), with the master (1) performing this repeated sending only after a delay, particular in the region of a few ms, and with the slaves (2) making the

requests in staggered fashion such that identical requests are sent only once over the network.

19. The method as claimed in one of the preceding claims, characterized in that the data streams or data packets are used to send at least one command, for example selected from the group Pause, Play, Stop, to the reproduction units (1, 2) together with an associated execution time, the execution time preferably being chosen such that at least the longest network delay time established in the network (4) between the master (1) and the reproduction unit (1, 2) can elapse between the transfer of the command to the network (4) and the execution time.

20. The method as claimed in one of the preceding claims, characterized in that the data streams or data packets are used to send the bit rate of the master (1) at which the master (1) provides the data streams or data packets on the network (4), the reproduction unit (1, 2) preferably using this bit rate to ascertain the delays which arise in the network.

21. The method as claimed in one of the preceding claims, characterized in that a reproduction unit (1, 2) which has been switched in transfers the data streams or data packets received from the network directly to the codec, and this codec rejects the supplied data by muting until the codec detects a first valid frame, the codec is then stopped and the current byte is noted, and the codec in the reproduction unit then processes the data stream or the data packets again and is switched to reproduction when this current byte is played on the master (1).

22. The method as claimed in one of the preceding claims, characterized in that at least one of the reproduction units (1, 2) is for its part used as master for a subnetwork, with appropriate repetitions

preferably being forwarded to the topmost master.

23. The method as claimed in one of the preceding claims, characterized in that at least one of the reproduction units (1, 2) has a memory which is used as a source of audio data, the content of these audio data possibly being obtained from the master (1) or from another data source.

24. A data processing program for carrying out a method as claimed in one of claims 1 to 23.

25. A reproduction unit for carrying out a method as claimed in one of claims 1 to 23, characterized in that it has a network interface, a central computer unit with a memory and means for at least indirectly outputting data, particularly in the form of a loudspeaker, characterized in that the memory contains a permanently programmed data processing program as claimed in claim 19, and in that this program is activated automatically after the power supply is turned on, with the reproduction unit particularly preferably having means for automatically integrating the unit into the network.